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The Educative Process. By WILLIAM CHANDLER BAGLEY. New York, The Macmillan Co. Pp. xix + 358.

As an attempt to organize the theory and practise of education in accordance with modern scientific thought and the results of psychological and genetic investigations, this book is well worthy of a review in SCIENCE.

In the view here presented, man is distinguished from other animals not only by his greater capacity to profit by his own experience, but especially by his ability to profit by the experiences of others transmitted to him through social habits and language. Education is the process by means of which the individual acquires experiences that will function in rendering more efficient his future action. Formal education includes the modifying influences, the control of which is consciously assumed either by the individual himself or by some educative agency, such as the home, church or school. The school is most important from the scientific point of view because its influence can be systematized and directed and the results determined.

Many of the principles of education are the same whatever the aim. The true aim of education may best be described as social efficiency. To be socially efficient a man must (1) pull his own weight, (2) interfere as little as possible with the effort of others, (3) consistently and persistently further progress.

Apperception is the reading of meaning into sense impressions and its chief law is 'The unifying of sense impressions into concrete experiences is accomplished through the adjustments to which the sensations themselves give rise.' The instincts of self preservation and of race preservation are the bases for the lower order of apperceptive systems, while those of the higher order are determined largely by acquired experiences.

Active attention and work must take the place of passive attention and play. The great work of the school is to produce this result and thus cause the instinctive and the near to be subordinated to the intellectual and remote. Hence education is largely a battle against nature. It should not, however, merely require certain activities, but it should de-

velop needs that will demand the acquisition of experiences that will be beneficial in mature life.

Experiences take the form of unconscious habits or of conscious judgments; the first should be unchangeable, the second adaptable. The judgments may be either practical or conceptional. A concept is an apperceptive system made explicit. There is danger of too much dealing with symbols before concepts are developed by experience. Ready-made instead of reasoned judgments are used a great deal. Organization is the important thing in conceptional judgments.

The stages of child development are a transition stage from six to eight, a formative stage from eight to twelve and the adolescent stage from twelve to eighteen.

Formal discipline in the sense of the generalization of a habit is not possible, but ideals may be carried over from one field of effort to another. The chief purpose of education is to develop high ideals. An ideal must be emotional as well as intellectual, and it is high as it is abstract, social, remote. Values of studies are classed as utilitarian, conventional, preparatory, theoretical, sentimental.

In the actual work of teaching, instincts need not development, but utilization, transformation or elimination. Not only should children be given models, but they should be led to admire them. Imitation starts processes and habits are formed by trial and error. Abstract teaching should lead to abstract judgments, not to more concrete.

Judgments may be given children ready made (the indirect method) or the child may be placed under conditions that will impel him to form them himself (the direct method). The indirect method is the principal one in the elementary schools.

The media of intellectual transmission are oral discussion; books and graphic representation, and of emotional transmission, literature, pictorial and plastic art and music and oratory.

Inductive development lessons are valuable though they have limitations, but deductive development lessons are equally important while the study lesson, the recitation lesson,

the drill, the review and the examination lessons have each an important place.

Such, with an additional chapter on the 'Hygiene of Instruction,' are the main thoughts of the book very briefly summarized. It is evident that this is a broad systematic treatise far in advance of the traditional pedagogical work on theory and practise. It gives promise of a body of knowledge founded on the established principles of biology, sociology, psychology, child study and educational practise, that may soon be designated as a science of education without any apologies.

The biological and psychological aspects of education are most emphasized, and the treatment of education reduced to its lowest terms in the earlier chapters is admirable. Hobhouse on genetic psychology and Hall on child study are his favorite authorities, while on general psychology most of the leading psychologists of the day are referred to and quoted. His facts and principles are, therefore, generally reliable.

A very noticeable, though minor, error in his psychology, is shown in his statement that marginal vision is now of no use to man. The most fundamental defect in his early formulation of the foundations of the science of education is his failure to recognize the significance of other instincts than those concerned directly in self and race preservation. Man with his adaptive instinct of play, curiosity and imitation, and his regulative instincts of morality and religion, to say nothing of his social, collective, constructive, dramatic, expressive and other instincts so much stronger than in animals, is naturally a learning, language forming, socially organizing animal. The right utilization of these instincts is the keynote of modern education instead of the old idea of the teacher as battling against nature which is expressly endorsed in chapter VI. by this author. Later he recognizes some of these instincts, but he nowhere gives them their true place as powerful springs of action by the proper utilization of which much of the war against nature in education may be charged to the wise direction and regulation of natural activities of children.

In another respect the book is very unsatis-

factory to the writer and certainly not in harmony with present educational movements. This is in his emphasis upon the indirect method of giving readymade judgments and of teaching by means of symbols. He admits the value of learning by experience and the artificial character of most school education, but yields so completely to the old school idea that in discussing media of instruction he omits to mention objects themselves (though in another place he discusses the use of objects, museums and excursions). At the present time when the best teachers are making great advances in rendering education less artificial through the more extensive and efficient use of objects and manual activities of all kinds, it is very disappointing to have a work that is so up to date in most respects fail not only in contributing something to this desirable advance, but to even pass it by as of little significance.

In one other respect the author's position is reactionary and in the light of present day thought and investigation untenable. This is shown in his endorsement of the absurd idea that the study of grammar rather than practise in seeing, hearing and using correct language is the proper method of learning to use good language forms. In this connection he holds that generally the conscious focusing of the mind upon each step is necessary to the rapid, efficient formation of habits. This is true in a large measure in adult, analytic and synthetic intellectual activities but not at all true of the lower order of intellectual and manual habits, especially of children, in whom the stages of analysis and synthesis are undifferentiated. In such cases the attempt to analyze and focalize on each step retards seriously the formation of habits. If children had to learn to walk, talk, control their bodies, etc., by the method of consciously focusing upon each step in those processes, many more years than are now required would be necessary to a much less perfect establishment of those habits. Even with older children, if the game of ball had to be learned by the method of focusing on each phase of the process, success in catching, batting, etc., would probably take much more of the boys'

time than it now does by the natural method. The most pernicious and untenable application of this idea appears when he claims that a child's attention should be focused upon the exact mistake he has made in previous repetitions.

In spite of these and some other less important mistakes and misplacements of emphasis, the book is a fresh, stimulating and generally correct organization of the principles of education.

WILBUR S. JACKMAN.

The Study of Chemical Composition. By IDA FREUND, Staff Lecturer and Associate of Newnham College. Cambridge, University Press. 1904. 8vo. Pp. xvi + 650.

This book presents an account of the method and historical development of the study of chemical composition. The initial discoveries forming the basis of the modern views of the composition of bodies are described, and the methods by means of which further experimental facts bearing upon the subject were obtained are clearly set forth. The historical development of the important laws is traced by showing how these grew from the study of certain classes of phenomena. In the course of this presentation many well-chosen quotations from classical original articles, including actual experimental data obtained, are given in sufficient detail to enable the reader to form an idea as to the degree of accuracy attained in the experiments which are of special consequence. Though the historical method of treatment has been adopted, no attempt has been made to secure such completeness or proportion as to deserve the name of history. The aim has been to describe only the most vital discoveries, and to do this thoroughly, rather than to dwell upon a greater number of facts.

A carefully written introduction of thirty pages devoted to a discussion of the method of inductive sciences prefaces the nineteen chapters in which the subject matter is treated. The first eight chapters deal with theories of combustion and the composition of bodies by weight. Here the work of Lavoisier, Dalton, Richter, Berthollet, Proust, Stas, Morley and

others is described. Chapter nine presents the views concerning the constitution of matter held prior to 1800, and the following chapter deals with Dalton's atomic theory. Chapters eleven to thirteen relate to the combination of gases by volume, the work of Avogadro and Cannizzaro, and the molecular hypothesis. After detailing the discovery of Dulong and Petit in chapter fourteen, the subjects of isomorphism, periodic law, valency and isomerism are treated in the chapters following, and the book is fittingly closed with a final chapter setting forth the modern views concerning the ultimate constitution of matter and the genesis of the elements.

Throughout the book, facts and theories have been sharply and clearly separated from each other, a matter of vital importance in a treatise of this nature. The treatment is concise, clear and conservative, yet none the less interesting. The book can be heartily recommended to students of physical science and others desiring a reasonably condensed presentation of the existing views of chemical composition. Like the other volumes of the Cambridge Physical Series, the book is well printed.

LOUIS KAHLBERG.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist, with the exception of the *American Journal of Science*, the oldest of the American scientific periodicals, announces a change in its editorial management. Dr. William McMichael Woodworth, who has so acceptably filled the position of editor-in-chief since 1898, retires and his place is taken by Dr. Glover M. Allen, the secretary of the Boston Society of Natural History. All correspondence intended for the editorial department should be directed to *The American Naturalist*, Cambridge, Mass.

The October issue of the *Journal of Nervous and Mental Disease* opens with a report by Dr. Frank R. Fry of a case of cerebral tumor which presented some puzzling symptoms which led to the belief that the tumor was located in the left cerebellum, whereas the autopsy discovered it occupying the greater part of the site of the left inferior